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A Review of Prefabricated Housing Evolution, Challenges, and Prospects Towards Sustainable Development in Libya

Abdulbaset Mohamed Ammari[1,2*], Ruhizal Roosli[1]

[1] School of Housing, Building and Planning, Universiti Sains Malaysia, Penang 11800, Malaysia
[2] Faculty of Art, University of Jafara, Tripoli 086, Libya

Corresponding Author Email: ammari@student.usm.my

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ABSTRACT

This research aims to overview and navigates the historical trajectory and current challenges of prefabricated housing technology in Libya, examining its evolution through a comprehensive review of historical documents, legislative frameworks, and academic studies. The study dissects adoption patterns, investigating socio-political and economic influences by utilising the narrative review approach. Despite post-Gaddafi legislative shifts, enforcement struggles amid political instability. Affordability concerns and limited governmental support emerge as pivotal financial challenges, impeding widespread implementation. Social factors, encompassing cultural attitudes and awareness, also hinder technology adoption. Implications emphasise the necessity for targeted governmental interventions, awareness campaigns, and public-private collaboration to surmount barriers. This research contributes to the discourse on sustainable housing solutions in Libya, offering insights for policymakers, researchers, and industry stakeholders. The primary factors influencing the adoption of prefabricated housing technology can be categorised into two groups, Technological and financial challenges, and social and logistic challenges. The findings establish a foundation for future studies to enhance understanding and implementation of prefabricated housing technologies in dynamic socio-political contexts.

1. INTRODUCTION

The roots of prefabricated architecture can be traced back to the 11th century, as documented in historical records [1]. By 2009, prefabrication had gained significant momentum, with usage in nearly 60% of construction projects in countries such as Denmark, Sweden, the United States, Japan, and Singapore [2]. Prefabrication involves assembling structural components in a controlled manufacturing or production facility and then transporting fully or partially assembled elements to the final installation site. This method results from the synergy of effective design and modern, high-performance elements, guided by quality-controlled manufacturing procedures. Prefabricated buildings provide various advantages, including faster construction timelines, conservation of water and land resources, noise mitigation, material efficiency, and energy savings [3].

Despite these advantages, several studies, including those by Amankwah et al. [4], Arif et al. [5], Kolo et al. [6], and Zhai et al. [7], have highlighted barriers to adopting prefabrication technology in diverse contexts. However, the widespread adoption of prefabricated construction has not yet become a primary consideration in developing countries, primarily due to a lack of complete understanding regarding the comparatively higher costs and implementation complexities associated with this approach [8]. Thus, the question on the current situation of the adoption process of the prefabricated housing technology is elevated in the Libya's construction industry sector.

Before Libya's independence in 1951, steel systems were already used across various structures, such as schools, government buildings, and railways. Prefabricated concrete constructions had found a place in Libya's sports sector as early as the 1960s. However, it was not until the early 1970s that these prefabricated concrete buildings became integral to the public housing initiative. The General Housing Agency recognised the urgent need for accelerated home construction in Tripoli and Benghazi due to significant internal migration by the mid-1950s. Two manufacturing plants were established for fabricating concrete components to address this problem. Each facility aimed to produce approximately 1,200 units annually, with each unit comprising a four-story building. The first plant, constructed in Benghazi in 1973 at around $79 million, was followed by a plant in Tripoli in 1974, costing $135 million [9].

The Libyan General Organization for Housing introduced prefabricated building systems in Tripoli and Benghazi, drawing inspiration from designs like the French Tracoba and Danish Larsen Nielsen, characterised by load-bearing concrete walls. From 1970 to 1978, prefabricated materials constituted

4.7% of public housing units and 2% of private housing units, totalling 156,067 finished units [10]. However, challenges, such as limited land availability in Tripoli, resulted in actual percentages falling short of initial plans. For instance, only 3,150 units out of the intended 7,000 flats were realised [11].

According to Stallen et al. [12], the failure of prefabricated buildings during that period was attributed to high costs, temperature-related issues, assembly concerns, lack of adaptability, and cultural mismatch. Despite these challenges, foreign technologies penetrated and established themselves within the local construction sector. During the late 1970s and 1980s, state-owned enterprises extensively used prefabricated building structures. Two predominant systems emerged: frame systems with medium and heavy-weight frames and panel systems with lightweight frames. Medium-weight panels involved metal frames and composite materials, while heavy-weight panels were manufactured in factories or on-site using concrete. Temporary volumetric systems, known as box systems, found application in the oil industry [13].

Despite using over 80% of local resources for panel component fabrication, technology for prefabricated concrete panels was mainly imported. Prefabricated buildings offer economic benefits, being more cost-effective and flexible in design, securing bulk material discounts, and reducing the risk of hiring unskilled or unmotivated labour [14, 15]. While prefabrication holds promise, challenges such as workplace injuries require comprehensive evaluation. Nevertheless, prefabricated construction has transformed the construction sector in Libya, offering eco-friendly practices, cost efficiencies, adaptability, consistency, minimised disruptions, accelerated timelines, and increased productivity [16, 17].

International enterprises have played a pivotal role in aiding the growth of public corporations due to the scarcity of local proficiency in these building methods. However, the lack of well-defined government policies has hindered effective technology acquisition, reducing funding for these ventures [11]. Since 2006, prefabricated structures' adoption in Libya has progressed gradually, with the National General Company for Manufactured Buildings in Tripoli operating the precast concrete factory before transitioning into constructing administrative and educational buildings. However, these endeavours have primarily been undertaken by foreign enterprises. All public enterprises consolidated into a unified entity in 2006, operating under the government's privatisation framework. This amalgamated company, though, only dedicates 2% of its efforts to prefabricated buildings [10].

Despite being stigmatised for low-quality, mass-produced buildings, the perception of prefabricated construction is evolving. It offers significant advantages in Libya, especially considering the country's energy challenges and the need for sustainable consumption practices. The fossil fuel sector's setbacks since 2011 underscore the importance of sustainable practices. Prefabricated construction presents a viable solution with reduced material usage, transportability, design flexibility, and energy efficiency. Additionally, it allows for substantial cost savings, controlled production settings, and adherence to quality standards, mitigating risks associated with on-site constructions [18].

Although several papers have discussed and examined the adoption of prefabricated houses in similar regions and developing countries, such as Han et al. [19], Abdulmajeed et al. [20], and Mohamed [21], this paper offers a distinct overview of the history of the adoption of the industry in developing countries with political instability, its effect on industry performance, and the challenges facing it.

Hence, this paper meticulously examines the historical development and contemporary challenges of prefabricated housing technology in Libya, unravelling legislative shifts, adoption patterns, and socio-economic factors. The objective is to provide a comprehensive understanding of its implementation's complexities, shedding light on financial, social, and logistical challenges. The scope encompasses an extensive analysis of related documents and academic studies, positioning it as a valuable resource for scholars, policymakers, and practitioners seeking insights into the evolution of prefabricated housing in Libya.

While our research addresses various disciplines, its significance lies in its contribution to fostering cross-disciplinary understanding of prefabricated housing. By integrating insights from fields such as architecture, engineering, urban planning, economics, sociology, and policy studies, our study offers a holistic perspective on the complexities surrounding the adoption of prefabricated housing. Specifically, our findings elucidate how historical, cultural, economic, and technological factors intersect to shape the dynamics of prefabricated housing in Libya. This cross-disciplinary approach not only enhances our comprehension of the challenges and opportunities associated with prefabrication but also facilitates the development of comprehensive solutions that transcend disciplinary boundaries.

2. METHODOLOGY

This research employs the narrative review approach to conduct an in-depth exploration of the existing literature, a method traditionally inclined towards qualitative interpretation [22]. Opting for a narrative approach in this study presents numerous advantages, especially when the goal is to offer a thorough comprehension of the topic. Embracing the narrative method brings forth a range of benefits, including the comprehensive synthesis of diverse information sources, flexibility in the review process, exploration of intricate issues, contextualization within broader contexts, and enhanced accessibility of the findings to a wider audience. These advantages collectively contribute to a more holistic and nuanced exploration of the subject matter, facilitating a deeper understanding of its complexities and implications.

Essentially, a narrative review seeks to succinctly summarize and synthesize existing literature on a specific topic without aiming to draw generalizations or cumulative knowledge. Instead, it focuses on accumulating and synthesizing literature to underscore the value of a particular perspective. Despite facing criticisms, this type of review proves highly beneficial in aggregating a substantial volume of literature within a specific subject area and synthesizing it [22]. Its primary objective lies in furnishing readers with a comprehensive background to comprehend current knowledge and highlight the significance of new research. Narrative reviews are frequently integrated into educational settings by faculty due to their up-to-date nature compared to textbooks, serving as a singular source for student reference and exposing them to peer-reviewed literature [23].

Moreover, alongside the narrative review approach, other review methodologies such as systematic reviews, scoping reviews, and meta-analyses offer alternative approaches to synthesizing existing literature. Systematic reviews employ a

rigorous and structured methodology to comprehensively search, select, and analyze relevant studies, aiming to minimize bias and provide an exhaustive summary of the evidence. Scoping reviews, on the other hand, aim to map the existing literature on a broad topic, identifying key concepts, gaps, and areas for further research, often using less stringent inclusion criteria compared to systematic reviews. Meta-analyses involve statistical synthesis of data from multiple studies to derive quantitative conclusions, particularly useful for evaluating the effectiveness of interventions or treatments. While these methodologies differ in their approach and objectives, they collectively contribute to advancing knowledge and informing evidence-based decision-making within various fields of research.

Regarding the theoretical framework, it serves as the conceptual backbone guiding the organization and synthesis of existing literature. Starting with an introduction that contextualizes the topic and explains the rationale behind the narrative review method, the paper identifies key concepts, themes, or theoretical perspectives pertinent to the subject matter. These elements form the foundation for structuring the review, which can be arranged chronologically, thematically, or by subtopics. Throughout the review process, existing literature is critically analyzed and synthesized within each conceptual or thematic area, elucidating significant studies, theories, and findings, while also pinpointing gaps or areas for further research. By assessing the strengths and weaknesses of the literature and proposing novel insights or directions for future inquiry, the paper contributes to advancing our comprehension of the topic and addresses the theoretical underpinnings shaping scholarly discourse within the field. Narrative reviews serve to stimulate research ideas by identifying gaps or inconsistencies in existing knowledge, aiding in the formulation of research questions or hypotheses. Importantly, they also function as educational resources, updating practitioners on specific topics or issues. Similar to systematic and scoping reviews, a narrative review evaluates, critiques, and summarizes available research on a given topic. This paper concentrates on previous work and literature concerning prefabricated building, delving into the historical evolution, particularly in developing countries and the North Africa region [24].

Several effective analytical techniques are utilized to synthesize and interpret qualitative data gathered from literature reviews. These techniques include thematic analysis, which involves identifying recurring themes or patterns within the narrative data. Additionally, content analysis is employed to systematically categorize and code narrative data, revealing key concepts, themes, or patterns. Furthermore, narrative analysis is applied to scrutinize the structure, content, and meaning of narratives, shedding light on how individuals construct their stories and derive meaning from their experiences. These methodological approaches collectively enhance the depth and richness of the research findings derived from qualitative data sources.

3. HOUSING CONCEPT IN LIBYA

Examining housing policy evolution in Libya unfolds in six distinct chronological phases, each marked by significant shifts in the government's role. Omar [25] categorises the post-independence years (1951-1962) into three epochs. The first, spanning 1961-1962, is characterised by an infusion of oil revenue. The second, covering 1963-1969, marks a new era of intentional public involvement in housing policy formulation and execution. The third, spanning 1970-2000, is post the revolution.

Sheibani and Havard [26] provide an additional subdivision of housing policy into two periods: the first from 1970 to 1978 and the second spanning 1979 to 1988, followed by a third period from 1989 to 2000. Moreover, Ibrahim [27] introduced further changes in Libya's housing policy following the Ghadaffi regime's era. The following sections offer a succinct overview of the literature on Libya's housing policy throughout these varying phases.

3.1 Initial era (1951 to 1962)

Following independence, Libya grappled with a significant shortage of adequate housing nationwide. This scarcity emerged as a critical concern, compounded by challenges such as a housing deficit, a substantial stock of substandard residences, inadequate maintenance of existing homes, the proliferation of informal settlements and unplanned urban growth, the high costs associated with urban land, and a shortage of skilled and technical labour within the construction sector.

In 1952, authorities introduced the First Six-Year National Development Plan from 1952 to 1958. This plan addressed various domains, including restoring war-damaged areas, improving public infrastructure and utility services, advancements in agricultural science, educational training, and population management [28]. During this period, the responsibility for constructing the limited available housing was upon the residents themselves. In rural areas, homeowners assumed the complete burden of constructing their dwellings, while in urban centres, contractors were engaged for this purpose. However, the construction and labour enterprises scarcity in urban locales hindered housing development. The Department of Public Relations Works in Tripoli had 146 registered contractors, and Benghazi had even fewer, with just 112 [29].

A 1962 Family Budget Survey highlighted the stark issue of overpopulation in Tripoli, where approximately 4% of the populace resided in households of four or more members, 39% in households of two to four members, and 15% in households with fewer than two individuals [29]. Approximately a quarter of the nation's housing inventory, around 45,300 units, was deteriorated, lacking fundamental amenities, and constructed using materials with limited lifespans. Nearly 19% of the country's total housing stock, approximately 36,200 units, required major renovations such as updated plumbing, windows, siding, and paint [30].

The scarcity and elevated costs of building materials were exacerbated because only about 20% of the country's construction materials were domestically sourced. The government refrained from intervening in the housing sector or establishing institutional or legal mechanisms to incentivise the expansion of housing supply, contributing to the challenging housing conditions. Consequently, the combination of rapid population growth, lack of government policy, and engagement led to a generally low level of housing development and a corresponding escalation of the housing crisis from 1952 to 1962.

3.2 Second phase (1962 to 1969)

Despite newfound prosperity from oil discoveries in the late 1950s, a significant portion of Libya's population continued to

endure substandard living conditions or homelessness. The government actively sought solutions to this pressing issue during this period. The repercussions of the housing crisis from 1951 to 1962 extended well beyond that particular era. By 1964, slums comprised 24% of all housing units in Tripoli City (approximately 8,000 units) and 17% of all housing units in Benghazi (roughly 3,000 units). A substantial 41% of the Libyan population resided in makeshift accommodations such as tents and shacks, with 3% taking refuge in subterranean chambers. This dire situation indicated that most of the country's housing stock was inadequate and unsanitary.

The discovery of oil in the early 1960s heralded a significant transformation in Libya's economy, paving the way for the government's inaugural five-year plan in 1963. Post-1963, the government promptly initiated implementing policies and concepts aligned with this plan, enlisting numerous agencies and departments to accomplish its objectives. The successful execution of the plan hinged on the involvement of skilled technologists, designers, and architects who possessed an understanding of and empathy for the needs of the populace. While certain overarching ideas underpinned these housing initiatives, they did not stem from a unified strategy to address existing challenges.

In 1963, the Ministry of Planning and Development took a step towards establishing a National Housing Policy by enlisting the expertise of Doxiadis Associates. This collaboration led to a comprehensive assessment of housing conditions and issues in Libya, culminating in the formulating of pertinent housing policies and programs. These policies were slated for implementation in 1964 under the title "Housing in Libya" [29]. The country's first-ever National Housing Policy aimed to accomplish three main goals: the elimination of slum dwellings within ten years, the reduction of the average occupancy density, and the provision of sufficient community facilities. This project's initial phase lasted five years, comprising three separate plans called the "Basic Foundation Programme."

1) Urban Housing Program: This group consisted of various projects with the common goal of meeting the pressing housing demands of major cities.

2) Rural Homes Program: Created to reduce the outflow of people from rural regions by raising their standard of life and providing better housing.

3) Special Housing Program: Established as separate initiatives to deliver much-needed housing to underserved communities in urban and rural settings.

In 1963, during the initiation of Libya's First Five-Year Development Plan, the Housing Construction Programme was allocated 10% of the budgeted spending. In its inaugural year, the program completed the construction of 4,000 homes, with 1,250 located in Benghazi and 2,500 in Tripoli [31].

To comprehensively address housing conditions and challenges, the government engaged Doxiadis & Associates in June 1963. The firm was tasked with conducting an in-depth study, evaluating housing concerns, and formulating effective housing policies and programs [32]. In August 1965, the Idris Housing Project was launched as a substantial effort to accelerate and enhance home construction. This ambitious initiative aimed to construct 100,000 new homes over five years, with an estimated cost of approximately LD 400,000,000. 60% of the project's budget was allocated to rural areas to counteract rapid urban-rural migration [33].

In 1966, the Ministry of Housing was established, marking the inception of Libya's first major housing initiative. Although some residences were designated for influential individuals such as cabinet officials and parliament members, the lack of coordination in housing strategies led to numerous unfinished homes, undermining the initiative's success [34]. Unfortunately, their failure to grasp the core issue contributed to the downfall of their efforts.

The housing improvement plan was made up of two different types of initiatives. The first type attempted to help low-income individuals, notably those living in slums, by developing affordable or cost-effective housing complexes. The second type encompassed smaller to medium-sized developments catering primarily to government employees. Between 1965 and 1969, 11,553 units of the first type and 3,332 units of the second type were constructed. However, this number fell considerably short of the required housing units. Many economic housing units, plagued by poor construction, deteriorated into slums within a year of occupancy. A significant proportion of these homes lacked three or more bedrooms. While the middle-range project homes were reasonably priced, their scarcity often made them go unclaimed [35]. Most of Libya's housing developments during this period were carried out without a robust social and economic framework or adherence to well-defined physical planning regulations.

3.3 Third phase (1970 to 1978)

Following the September 1969 revolution, Libya underwent significant housing policy changes, as Sheibani and Havard [26] outlined. In this post-revolution era, Libya introduced a series of legislative measures aimed at housing, including council leadership decisions on leases in 1969 and legalising property leasing for individuals and businesses. Subsequent legislation included Law 116 in 1972, empowering commercial banks to provide loans for home purchases, and Law 88 in 1975, mandating the nationalisation of land benefiting previously from bank facilities but used for purposes other than housing. Another Law 88, enacted in 1976, sanctioned the construction of housing complexes.

These legislations were part of Libya's proactive approach to preparing for future housing-related economic growth [26]. During this period, the government assumed a substantial role in the housing process, including planning, preparation for housing unit construction, and implementation by the public sector. Their initiatives aimed to address housing shortages that emerged in 1969. Additionally, the government encouraged private sector involvement in housing unit construction by advocating increased funding for essential services like healthcare and other social services.

Housing research identifies three common approaches nations adopt to address housing challenges within varying structural contexts. Between 1970 and 1978, Libya adopted the second approach, where the government assumed a leading role in housing initiatives while simultaneously facilitating private sector engagement. The government maintained a prominent position in housing development and distribution and opened doors for private sector involvement through sales or leasing arrangements. The public sector implemented policies to provide a suitable quantity of quality housing for low income, including public housing policy, fabricated housing policy, Sebha housing policy, agricultural housing policy, investment housing policy, and agricultural development housing policy.

Table 1. Progress of Libya's housing policies during the third phase (1970 - 1978)

Policy	1970 to 1974	1975	1976	1977	1978	Total
Public housing	19967	9979	5764	2810	2505	41025
Fabricated housing	0	150	0	0	3000	3150
Sebha housing	24	466	1607	2435	468	5000
Agricultural housing	5332	0	865	499	5294	11 990
Investment housing	0	0	1569	0	0	1569
Agricultural development	0	0	1690	1403	0	3093
Total of public sector	25 323	10 595	11 495	7147	11 267	65 827
Total of private sector	32 975	17 682	7600	6401	25 582	90 240
Total	58 928	28 277	19 095	13 548	36 849	156 067

Source: [26]

Despite government policies, the private sector accounted for 58.4%, building 90,186 units from 1970 to 1978, due to aided policies such as loans from real estate savings and investment banks and loans from commercial banks. Sheibani and Havard [26] noted that the public sector in Libya completed 66,827 housing units during this period, with 42.2% of the total distributed across various policies. Table 1 summarises the progress of these policies during this period.

3.4 Fourth phase (1979-1988)

In 1977, Libya shifted towards socialism as its economic system. Aligned with the principles of the green book ideology, work prompted modifications to Law 4 in 1977, prohibiting leasing and imposing restrictions on families owning more than one residence. This led to the confiscation of privately owned rental apartments [26]. While development resources increased from the previous year, the housing allocation dropped from 13.2% from 1970-1978 to 9.46% from 1979-1988 [36].

Several housing policies were implemented during this period, including Public Housing policy, Agricultural housing, Investment Housing, Sebha Housing, and Fabricated Housing. However, Sheibani and Havard [26] describe this phase as a period of instability in public housing policy, marked by a decrease in the number of constructed housing units. The policies formulated did not successfully achieve the initial goal of constructing 7,500 housing units. Only 5,943 housing units were developed throughout this period, primarily attributed to government incentives.

3.5 Fifth phase (1989- 2000)

The censure imposed on Libya by the United Nations in 1986 adversely affected its economic growth objectives and housing plans, causing a slowdown in progress. This compelled Libya to gradually engage more with the global community and enhance its policy framework. In response to these changes, more adaptable legal regulations were introduced. Notably, Law 8 of 1988 was enacted, permitting individuals to participate in commercial activities independently or in collaboration. Additionally, Law No. 11 of 1992 concerning real estate ownership was enacted as amended by Law No. 14 of 1996. This legislation granted individuals the right to own multiple residences or parcels of land that could be developed. Both public and private entities gained the authority to construct homes for sale, and some entities and individuals were allowed to lease properties, reversing the restrictions imposed by Law 4 in 1978.

This period witnessed the government authorising certain public and private organisations to invest in housing through construction, sale, and leasing. Furthermore, specific individuals were granted the privilege to own multiple homes or plots of land under specified conditions.

During this phase, housing policy aimed at diminishing the government's influence in the housing market. However, between 1988 and 1996, policy remained relatively steady before undergoing a shift. As a result, this period can be divided into two distinct halves: the initial phase from 1986 to 1996 and the subsequent phase from 1997 to 2000. Despite economic fluctuations, the years spanning from 1989 to 1996 exhibited minimal changes due to the leniency of the new regulations.

3.5.1 Public sector policymaking

Regarding public sector policymaking, there was a prevailing inclination to uphold the established classifications. Notably, a plan emerged for social housing management, indicating the government's inclination to shift away from direct involvement in public housing provision. A mere 6,235 homes were completed during this time frame, constituting approximately a quarter of the total completed in the preceding period. Within this context, the government constructed 26.7% of all homes. Following the prior phase, which witnessed the initiation of significant projects under the General Projects Housing Policy, the government provided houses for employees engaged in these ventures. Notably, the number of homes surged from 200 in 1991 to 3,321 in 1996, marking a threefold increase. This expansion was largely attributed to the Housing Policy of General Projects Housing, resulting in the construction of 3,521 homes, accounting for approximately 4% of all homes built between 1989 and 1996 [37].

Furthermore, a New Cities and Villages Housing Policy was introduced to alleviate the overcrowding in coastal cities. This policy led to the establishment of multiple towns and cities, addressing the issue of population congestion [37]. A significant number of homes, totalling 11,585, received demolition orders between 1989 and 1996, representing 12.8% of all homes within that timeframe.

The Housing Investment Act was pivotal in shaping housing dynamics during this period. A notable consequence of this program was the considerable increase in the number of homes demolished. With the introduction of new regulations that allowed organisations to invest in housing, several entities such as the National Investments Company, Real Estate Savings and Investment Bank, and The National Council for Real Estate Investments engaged in home construction. This effort resulted in homes accounting for 23.9% of all executions, with the public sector contributing to 43.1% of these demolitions.

3.5.2 Private sector policymaking

During this period, a substantial proportion of completed housing units, amounting to 40,281 units, accounted for 44.6% of the total completed housing units. Specific details regarding the roles played by entities such as the Real Estate Saving and Investment Bank (RESIB), commercial banks, housing societies, or individual financiers remain elusive. Notably, the absence of government incentives for banks to provide loans during this period resulted in a slowdown of housing execution within the private sector compared to the preceding era of 1989-1996 [37].

From 1997 to 2000, we witnessed the emergence of a growing housing scarcity driven by soaring demand that surpassed the available housing inventory. By 2000, the housing shortfall was projected to reach 240,000 units [38].

Plans were formulated to construct 60,000 new dwellings to address this pressing housing crisis. Notably, the development fund covered the entire cost of this ambitious proposal, except for unfinished residences from previous projects. It was planned to produce 10,000 units in 1996, 20,000 in 1997, and 30,000 in 1998.

The following measures were offered to help accomplish this objective:

1) **Housing Policy That is Still in Progress:** The strategy set a target of 10,000 units to be completed between 1996 and 1998. These items were unspent from previous agreements. The Treasury Department paid for the distribution of 6,000 units to low-income families. By the year 2000, fewer than 1,560 of the planned housing units had been built. This represented just 15.6% of the original goal.

2) **General Policymaking Bodies:** The Social Insurance Fund, Islamic Appeal Association, National Institution for Oil, and the Libyan Insurance Company are among the umbrella organisations that will be able to build a total of 5,000 homes with the help of this plan. These structures are erected to house their staff and serve as a potential investment vehicle. Unfortunately, no information on actual completions is provided under this policy.

3) **A Housing Investment Plan:** During this time, governmental and private investment firms were tasked with erecting 30,000 apartments. The number of completed units was 2,373, or 7.9% of the objective. The challenges in establishing documented credit for import goods and the complexity of lending processes were the primary causes of this very low-interest rate [39].

4) **Loan and Association Policies:** An estimated 14,000 dwellings were planned to be constructed under this plan. Ten thousand were made possible by financing from the Real Estate Savings and Investment Bank (RESIB), two thousand by conventional banks, two thousand by housing cooperatives, and one thousand by buyers. Due to a severe funding shortage, many organisations could not approve the loans. That is why there are problems with this software.

During this time, the government shifted from bailing out its citizens to assisting them. After a lengthy hiatus, public and private enterprises continuously attempted to participate in the real estate market. Moreover, housing rules were all over the place from 1996 to 2000.

3.6 Post-Gadaffi period

Complaints and controversies surrounding Law 4/1978 have significantly shaped Libya's housing policy and legislative landscape in the post-Gaddafi era. This law restricted renting out properties and limited the number of dwellings an individual could legally own before the government claimed their assets. Following the overthrow of Gaddafi's dictatorship, former property owners sought reparation from the transitional government to regain ownership of their properties. In late 2015, the General National Congress (GNC), Libya's legislature, passed two laws - Law 16 (which overturned Law 4) and Law 20 (which addressed the consequences) [27]. However, due to the absence of a central authority and the country's fragmented state, enforcing these regulations across more than half the nation remains uncertain.

Libya made efforts to expand its real estate market and attract international investment in the years leading up to the downfall of Gaddafi's regime, highlighted by Decree 21 in 2006 [40]. This regulation conferred upon the Housing and Infrastructure Board (HIB) the power to engage in land development contracts with private and international developers. However, efforts to liberalize the property and real estate markets encountered substantial delays owing to prolonged instability in the aftermath of the revolution. This instability fostered a climate of uncertainty among investors, despite the fact that international investors are now permitted to acquire real estate. The land market experienced tumultuous conditions following the seizure, exacerbated by the destruction of property records in the early 1980s. This upheaval prompted many individuals to advocate for reforms in property regulations and compensation policies, as highlighted by Almabrouk [41].

Despite introducing various Property Bills in Parliament, their enactment has been hindered by political disputes and controversies surrounding the proposals. The absence of a clear resolution has led to further complications, including the resale of properties and uncertainty in property rights. Corruption and administrative challenges have further hindered the real estate sector, with Libya ranking as the 170th most corrupt country out of 180 in Transparency International's 2018 Corruption Perceptions Index. Consequently, the quality of life and access to secure housing have deteriorated, with the Human Development Index (HDI) dropping to 108 in 2018, reflecting worsening living conditions. The economy's distress, driven by inflation, has eroded the purchasing power of Libyan families by over 80%, exacerbating the housing crisis.

The housing situation is dire due to a high unemployment rate of 17.3%, leading to an increase in rents that most families cannot afford. The scarcity of formal housing options since 2013 has left numerous development programs, including a significant housing initiative with Libya HIB, dormant. Political instability and criminality have further stalled housing contracts with multinational companies. President of HIB, Mahmood Baclir Ajaj, predicts that the housing deficit will reach 500,000 units by 2020 [39].

The current political climate is not conducive to new land development, and while the real estate market has slowed, it still holds potential. Law No. 4 significantly impacted the Libyan real estate market as it prohibited ownership for rental purposes, resulting in decreased activity. Administrative instability has been exacerbated by frequent changes in public officials at both high and low levels. The merger and partition of administrative districts have also contributed to administrative upheaval. Libya's political turmoil has further aggravated its challenges, reflected in its dismal ranking of 186th in the world for processing building permits. The

nation's lack of basic infrastructure worsens the construction industry's difficulties [42].

4. PREFABRICATED HOUSING TECHNOLOGY

4.1 Prefabricated housing adoption in the developing and developed countries

Steinhardt and Manley [43] proposed that several key factors play a pivotal role in adopting prefabricated housing, especially when comparing developed and developing nations. These factors encompass annual housing completions, the ratio of new construction versus rehabilitation, innovative homeownership models, and the types of housing structures erected. Their analyses illuminated the intricate interplay of these factors and their potential impact on the popularity of prefabricated homes.

In the Netherlands, long-term acceptance of prefabricated housing hinges on five determinants: the regional presence of housebuilders, operational excellence, alignment with existing technological standards, competitive value addition, and the adaptability of the housing system to evolving market needs [44]. Research conducted in China by Tam et al. [45] indicated that prefabrication could lead to substantial material cost savings of up to 84.7% and eliminate waste generation.

A study by Chiang et al. [46] scrutinised the obstacles to prefabrication in Hong Kong's public housing and institutional projects. Their findings suggested that Herfinndahl-Hershamann indices did not correlate with prefabrication in general. The mandate for prefabrication did not independently contribute to increased construction difficulty for prefabricated homes. Steinhardt et al. [47] utilised a framework to delve into significant concerns such as user reluctance toward prefab dwellings in Australia, the pros and cons of supplier-builder relationships, the risks and advantages of fostering close collaboration, and the resistance from business and cultural perspectives to process changes.

Sweden leads the world in prefabrication, with approximately 84% of structures being manufactured off-site. Lindbacks, an established construction company, employs an innovative method called "screen to machine," where enormous machines transform wood into complete walls, including doors and seals, in just 20 minutes. The company produces a substantial volume of housing units, apartment complexes, and assisted living facilities weekly [48]. Factory-built houses constitute only about 10% of residential building licenses in Germany. However, an episode of the TV show Grand Designs featuring the construction of a structure known as the Huf Haus might have bolstered interest in German architectural and building techniques in Australia and the United Kingdom [48].

4.2 Prefabricated housing pattern adoption in Libya

Research on prefabricated housing in Libya has been limited, with one notable reference being El Abidi [49]. According to their findings, the utilisation of precast concrete in Libya was introduced relatively late, only gaining traction in the early 1960s. This was after various structures such as schools, government buildings, temporary dwellings, and railways had already been constructed using steel. The Libyan government's initial foray into prefabricated technology occurred when they engaged the British firm Toms & Candy to construct two sports facilities for the Sports City project. Additionally, they collaborated with the Bulgarian company Techno-Export Stroy to construct the first and first phases of the second project. The first phase, located in Benghazi, included a soccer stadium with seating for 55,000, tennis courts, swimming pools, a sports centre with a steel roof, parking, and various amenities. The second phase in Tripoli involved a soccer stadium accommodating approximately 75,000 spectators and similar amenities [37].

Both projects commenced in 1964 and were completed in 1967, employing a combination of traditional and prefabricated concrete elements. Concurrently, as plans were underway for the Bayda to Marj road project, the government sought a solution for constructing a bridge over the Wadi Kuf valley. Designed by Italian civil engineer Riccardo Morandi, the Wadi Kuf Bridge was constructed by his company, Construzioni Stradali Civili S.A. This bridge, spanning 477 meters in length and 282 meters in width, stood out for utilising pre-stressed concrete stays instead of the more conventional wire-chain stays, making it a unique structure (Structure Website). The project, encompassing construction and establishing a mostly prefabricated casting yard, spanned from 1961 to 1968. These endeavours aimed not only to provide housing but also to replace makeshift dwellings through meticulous planning of both operations and financial aspects. However, conventional construction methods struggled to meet the growing demand for new homes.

Recognising this, by the end of the 1960s, the Ministry of Housing and Utilities, also known as the "General Organization for Housing," proposed an ambitious strategy. This plan involved establishing two factories for producing prefabricated housing components, each intended to generate up to 1,200 flats annually [37]. The establishment of the two prefabrication plants was undertaken through a comprehensive turn-key project, where the French firm DUMEZ BTIMENT and the French Tracoba Concrete Wall Loading System were involved in constructing the first plant in Benghazi. This factory was completed in 1974, after which the Ministry of Housing and Utilities engaged the same company to construct four four-story apartment buildings comprising 3,000 apartment units, along with project infrastructure finalised by 1978. The second plant in Tripoli was constructed using the Danish Larsen Nielsen Concrete Wall Loading System. This plant came into being through a contract awarded by the Ministry of Housing and Utilities to Danish companies HQJGAAD & SCHULTZ and RIKI.

While both factories were established, challenges and delays affected their output. The Benghazi branch of a national prefabrication company began in 1978, using the factory space to construct a school, an administration building, and a multipurpose hall. This company operated as a subcontractor for the Korean conglomerate Daewoo until 1989. Then, from 1990 to 1995, they collaborated directly. Subsequently, the company continued its operations independently, merging with other public enterprises in 2006 during the government's privatisation efforts. This move marked its expansion into more conventional forms of construction.

In Tripoli, the National General Company for Manufacturing Buildings was established in 1980 and was engaged by the Ministry of Housing and Utilities the following year to construct 2,000 flats with the assistance of

Danish firm Thomash Ashmidt. However, scarce land and other obstacles limited the company's output to 935 completed units by 1986. The company also played a role in public market construction during this period. A general construction and maintenance organisation was set up by the Ministry of Housing and Utilities in 1977 to oversee and execute public utility projects. The company's involvement extended to creating public marketplaces, employing concepts comparable to prefabrication. Various models were introduced, including the "five-storey" design, which saw the construction of public metal marketplaces in Tripoli and Benghazi. Subsequent models, such as the "quick markets" plan and the "permanent markets" model, were also implemented, incorporating precast concrete and other materials. Despite plans to construct numerous public markets using the "permanent markets" model, only a fraction was realised due to delays and challenges.

The Military Works Company, a division of the Libyan General Interim Defense Committee, forged a significant partnership in 1981 with the Hungarian military company Lamkiv to undertake the construction of military facilities within Libya. This collaborative effort led to the creation of a combined entity known as the Arab Libyan Hungarian Military Construction Company. The incorporation of prefabricated structures played a pivotal role in shaping architectural designs during this endeavor. Notably, in the Sokna area of the central region, numerous metal workshops were established to support construction activities, while the Green Mountain outpost specialized in the production of precast concrete components. Additionally, specialized teams were dispatched to various regions to facilitate construction efforts, as elucidated by Elmassri et al. [50].

The Jebel Akhdar office effectively utilised the factory to complete various public projects. These included the construction of a bank in Al Qubbah, a bus station in Al Abraq, and an industrial professions institution in Shahhat. In 1986, the Hungarian military company exited the joint venture, but it returned after two years to finalise the postponed prefabricated projects. This extension encompassed all projects except one within the Green Mountain division. Subsequently, conventional construction methods were employed to bring these projects to completion.

Table 2 presents a comprehensive overview of various studies on adopting prefabricated housing globally, highlighting essential details such as research methods employed, geographic locations covered, and the main findings of each study. This compilation offers a valuable resource for understanding the diverse approaches, geographical contexts, and key insights derived from research on prefabricated housing adoption across different regions.

Table 2. Earlier investigations on (Prefabricated housing adoption)

No.	Author/Year	Location	Research Title	Research Methodology	Findings
1	(Blismas et al., 2010) [51]	Australia	Concrete prefabricated housing via advances in systems technologies - Development of a technology roadmap	The paper describes Australia's concrete and housing industries' collaboration in a project to develop a technology and innovation roadmap to advance supply chain capabilities by identifying and mapping innovation necessary for prefabricated concrete house construction.	The system-based approach to prefabrication is seen as innovative, and the industry needs to understand how to adopt cooperative innovations in prefabrication in order to be competitive.
2	(Steinhardt et al., 2013) [47]	Australia	Reshaping housing: the role of prefabricated systems	Systematic Literature Review (SLR)	The framework facilitated the identification of central issues such as the prevalent business and cultural resistance associated with process changes, the potential for efficiency and quality improvements and cost savings, the simultaneous risks and benefits of close supplier-builder relationships, and negative user perceptions towards prefabricated houses.
3	(Steinhardt and Manley, 2016) [43]	Australia	Adoption of prefabricated housing-the role of country context	This paper focuses on accessible, empirical, and referenced evidence from housing industries.	The main determinants of adoption are revealed to be (1) annual number of housing completions, (2) rates of new building versus renovation, (3) new housing ownership models, and (4) types of housing constructed. Analyses revealed the complexity of interacting factors and their potential influences on the uptake of prefabricated housing.
4	(Cheng et al., 2017) [52]	China	Major Barriers to Different Kinds of Prefabricated Public Housing in China: The Developers' Perspective	There are 65 public housing pilot projects to investigate, and 45 project developers gave valid responses. The analytic hierarchy process (AHP) is used to identify the major barriers.	They concluded that "scale diseconomies due to an inadequate level of standardisation," "high-cost conventional construction," and "incomplete industry chain" are the top three obstacles. The paper also indicates that from the developers' perspective, the most dominant barrier is cost regarding prefabricated public housing in China.

5	(Elkaftangui and Basem, 2018) [53]	United Arab Emirates	Optimising prefabricated construction techniques in UAE as a solution to the shortage of middle-income housing	Qualitative (Secondary Data).	For public rental houses, the primary barrier is the industrial chain. Compared Several factors that have contributed to the current shortage of affordable housing, high land values, High capital costs for associated infrastructure development, and low adoption of prefabricated construction techniques have contributed to higher construction costs and lower financial returns, making such developments less attractive for developers, limited access to suitable finance for low-income families, due to generally immature mortgage markets. Resolving the shortage of middle-income housing requires a concentrated effort.
6	(Van Oorschot et al., 2019) [44]	Netherlands	The continued adoption of housing systems in the Netherlands: A multiple case study	Case study	At least five factors influence long-term adoption: the builder's regional presence; operational excellence, a natural fit with existing technology standards; a competitive added value; and the ability of the housebuilder to keep up with changing market requirements and stay alert and adapt the housing system to changing market requirements.
7	(Steinhardt et al., 2020) [54]	Australia	The Australian structure of emergent prefabricated housing industries: a comparative case study of Australia and SwedenThe structure of emergent prefabricated housing industries: a comparative case study of Australia and Sweden	A new framework is proposed for this purpose, enabling a repeatable, orderly and comprehensive disaggregation of industry structure to examine the latent drivers of relational capability. (Quantitative). A new framework is proposed for this purpose, enabling a repeatable, orderly and comprehensive disaggregation of industry structure to examine the latent drivers of relational capability. (Quantitative).	The main empirical contribution is to (1) describe an industry that is yet to be formally recognised by national statistical agencies and (2) show how adopting prefabricated housing can be accelerated. The study found that younger industries need a focused industry association with diverse membership to act as an effective system integrator. The main empirical contribution is to (1) describe an industry that is yet to be formally recognised by national statistical agencies and (2) show how adopting prefabricated housing can be accelerated. The study found that younger industries need a focused industry association with diverse membership to act as an effective system integrator.
8	(Wang et al., 2021) [55]	China	Analysing factors affecting developers' behaviour towards the adoption of prefabricated housing in China	Quantitative	A highly positive correlation was noted between developers' behavioural intention and adoption behaviour. Government regulation and economic viability also presented a significant positive promoting effect on adoption behaviour. The additional variable 'EV' had the most influential impact on developers' behaviour.

5. PREFABRICATED HOUSING ADAPTION CHALLENGES

5.1 Challenges arising from expectations

New technologies often encounter significant challenges concerning user expectations, particularly in performance and effort expectancy. Performance expectancy, as defined by Venkatesh et al. [56], refers to the user's perception that using specific technology, such as prefabricated housing, will facilitate the accomplishment of particular needs or contribute to an essential lifestyle. Howard et al. [57] conducted a study exploring individual experiences with emerging technology in the United Kingdom's construction industry. Surprisingly, the study found that the expectation of success did not directly influence the behavioural intention to adopt emerging technology during the construction phase of the workflow. These findings underscore the need to reassess business regulations, implementation strategies, and incentive structures to foster the adoption of prefabricated building techniques.

Conversely, "effort expectation" concerns technology's perceived difficulty [56]. This concept encompasses three constructs: perceived ease of use, difficulty, and overall ease of use. Previous research consistently demonstrates that the anticipation of effort profoundly impacts the intention to use technology and its actual utilisation [56, 58, 59]. The primary challenge lies in users' belief that adopting new technology would be straightforward and beneficial. However, this assumption becomes more complex and challenging in the

construction industry.

5.2 Technological and financial challenges

5.2.1 Financial technological concerns

The adoption of new technologies, such as prefabricated buildings, is significantly influenced by financial and technological considerations. Affordable housing, classified as affordable housing to those with a household income at or below the median, is pivotal in accepting prefabricated construction methods [60]. A study by Sholanke et al. [61] indicated that most survey participants believed that opting for prefabricated buildings did not necessarily result in greater cost savings than traditional construction methods. Within this context, Elghdban et al. [62] define affordability as the condition of being priced reasonably, ensuring accessibility for individuals to make purchases, while accounting for the intricate equilibrium between income and essential expenditures. This definition underscores the importance of striking a delicate balance that accommodates individuals' financial capabilities amidst their necessary financial commitments. Housing affordability specifically addresses the feasibility of obtaining housing standards at a cost or rental rate that does not impose an unreasonable financial burden on household incomes [61].

5.2.2 Factors influencing housing development

Al-Homoud et al. [63] identified several factors influencing housing development and supply within the housing market. Macroeconomic factors, property rights safeguarding, availability and affordability of serviced land, land use regulations, construction and production costs, collaboration through public-private partnerships, streamlined processes in commercial banks, and the proportion of housing units sharing services and infrastructure are all critical indicators. According to Al-Homoud et al. [63], achieving affordable housing requires government involvement, with housing provision contingent on weighing risks against projected market prices and costs. The lack of financial capacity among many North African and Middle Eastern governments to address the housing crisis alone emphasises the need for collaborative government and private sector mechanisms.

5.2.3 Housing affordability and prefabricated buildings (PBs)

Housing affordability, a central concept in policy development, is fundamentally tied to an individual's income supporting the costs of homeownership [61]. Prefabricated Buildings (PBs) are positioned to offer cost-effective housing and promote affordable lifestyles, technology, and efficient home construction. Leveraging advanced technologies, the Libyan government aims for 90% off-site production and 10% on-site construction for high-quality prefabricated modular dwellings [64].

5.2.4 Facilitating conditions

On another note, "facilitating circumstances" refers to how individuals perceive their organisational infrastructure as supportive of adopting anticipated technology. Venkatesh et al. [56] defined facilitating conditions as users' perceptions regarding adequate technical and infrastructural support for a particular technology, such as prefabricated housing. In a study by Merschbrock and Rolfsen [65] on the acceptance of Building Information Modelling (BIM), a sophisticated virtual model replaced the traditional approach of creating and placing reinforcement bars using paper-based shop drawings in the construction of a new airport terminal in Oslo, Norway. The findings indicated that the staff perceived the virtual model as more beneficial than traditional shop sketches, highlighting the importance of facilitating conditions in technology adoption.

5.3 Social and logistic challenges

Adopting new technology or construction processes has a substantial impact on numerous stakeholders in the construction sector, including the industry, government, and society. Successful adoption and implementation of such technologies require support from these sectors to facilitate integration into the field. Logistic factors, including social influences, attitudes, culture, awareness, and governmental support, play a pivotal role in determining the success of the technology and its overall effectiveness.

5.3.1 Social influences

As Rogers [66] introduced, social factors encompass the belief that adopting a new technology enhances an individual's image or social standing. The extent to which the perceptions and opinions of friends, family, and influential personalities impact users' views toward prefabricated housing technology is defined as social influence [67]. Davies and Harty's [68] research, along with Elghadban et al.'s [62] and Saleh et al. [69] studies focusing on the implementation of Building Information Modelling (BIM) within construction contracting organizations, elucidated a significant correlation between social influence and users' attitudes toward technology adoption in the construction sector. While there have been noticeable shifts in attitudes since the 1980s, largely attributed to the introduction of open systems by foreign entities, Libya's enduring housing shortages have impeded any substantial transformative change in public perceptions. These persistent challenges underscore the complexities surrounding technology adoption within the construction industry, particularly in regions facing prolonged socio-economic constraints.

5.3.2 Attitude and cultural challenges

Attitude, a crucial behavioural aspect, significantly influences the adoption of innovations [70]. Negative perceptions about prefabricated buildings, originating from historical setbacks, continue to hinder broader acceptance within the construction industry [71]. The industry's resistance to innovative approaches poses challenges despite increasing projects executed through design-and-build contracts, facilitating early integration of building services [72]. Raising industry awareness and providing technical support to smaller contractors can ease the transition and bridge the cultural gap in adopting modular prefabricated systems.

5.3.3 Awareness and technical knowledge

Enhancing awareness among users and practitioners about the nature of prefabricated structures, their potential applications, and technological possibilities is crucial for increasing adoption [73]. Architectural knowledge and familiarity with the prefabrication process directly affect housing projects' timely and cost-effective completion. A study in Nigeria demonstrated a high awareness among

architects, influencing the choice of prefabricated construction for its benefits, including waste reduction, shortened construction times, and cost savings [61]. Investigating the impact of awareness and familiarity with technical aspects on prefabricated construction adoption becomes imperative at the national level in Libya.

5.3.4 Governmental support challenges

Governmental support emerges as a significant challenge for prefabricated technology. In the post-2006 period, local businesses turned to bank financing for general contractors, requiring synchronisation of supply and demand strategies to leverage the private sector's potential effectively. Housing challenges, primarily affordability, depend on addressing inadequate housing expenditure and construction regulations. Limited access to bank loans or government support impedes housing projects, impacting Libya's escalating housing problem. Offering governmental support, particularly in regulations and financial assistance, can enhance the viability of private-sector prefabrication. Libya has a unique opportunity to prioritise such support, aligning with the government's focus on small and medium-sized business growth.

6. DISCUSSION

This study offers a comprehensive examination of the complexities surrounding the adoption of prefabricated housing technology in Libya. Our investigation delves deeply into various dimensions, encompassing meticulous historical analysis, legislative scrutiny, and a critical evaluation of the multifaceted challenges—technological, financial, social, and logistical—that accompany prefabrication. Through a rigorous review of literature and case studies, our methodology aims to provide a nuanced understanding of the intricate landscape of prefabricated housing in Libya. The primary findings underscore the intricate interplay among historical, legislative, and contemporary factors shaping the adoption of prefabricated housing. Libya's trajectory illustrates a convoluted interaction of political, economic, and technological forces, spanning from the delayed introduction of precast concrete in the 1960s to the establishment of prefabrication plants in the 1970s. Despite notable advancements, the study reveals persistent challenges within the sector, including financial constraints, societal perceptions, and logistical hurdles, all contributing to the slower-than-anticipated adoption of prefabricated construction.

However, it is imperative to acknowledge the inherent limitations of our study. The scarcity of recent and in-depth research on prefabricated housing in Libya posed significant challenges in accessing up-to-date information. Moreover, the region's political instability and economic constraints have hindered the implementation of innovative technologies, thereby impacting the availability of empirical data. These constraints underscore the necessity for future studies to address these gaps and offer a more current and detailed analysis of the subject matter.

In addition to acknowledging the limitations of our study, it is essential to delve further into the implications of our findings and their broader significance. The intricate interplay of historical, legislative, and contemporary factors in shaping the adoption of prefabricated housing underscores the complex nature of the construction industry in Libya. The delayed introduction of precast concrete in the 1960s and subsequent establishment of prefabrication plants in the 1970s reflect not only technological advancements but also the influence of political and economic factors on infrastructure development.

One of the key implications of our research is the need for targeted interventions to address the persistent challenges facing the prefabricated housing sector in Libya. Financial constraints, societal perceptions, and logistical obstacles have all contributed to the slower-than-expected adoption of prefabricated construction methods. Addressing these challenges requires a multi-faceted approach that includes targeted policy interventions, public awareness campaigns, and investment in infrastructure and technological innovation.

Furthermore, our study highlights the importance of conducting more robust and up-to-date research on prefabricated housing in Libya. The scarcity of recent and in-depth studies underscores the need for greater attention to this topic, particularly given its potential to address pressing housing needs in the region. Future research efforts should aim to overcome the limitations identified in our study by accessing more current data, exploring innovative research methodologies, and engaging with stakeholders across the construction industry.

Overall, our findings contribute to a deeper understanding of the challenges and dynamics surrounding the adoption of prefabricated housing technology in Libya. By shedding light on the complexities of this issue, our research provides valuable insights that can inform policy and practice in the construction industry, ultimately contributing to sustainable development and improved living standards in Libya and beyond.

7. CONCLUSION

Building upon our findings, we propose several recommendations for future research efforts. Firstly, scholars should endeavour to bridge the gap between historical practices and contemporary challenges in the adoption of prefabricated housing. This investigation could provide valuable insights into how past experiences influence current perceptions and practices within the field. Secondly, further exploration into the impact of governmental policies and financial incentives on promoting prefabrication is warranted. Understanding the effects of such interventions can shed light on potential avenues for enhancing adoption rates and overcoming existing barriers. Additionally, a deeper examination of societal attitudes and awareness regarding prefabricated housing, taking into account cultural influences, is crucial. Such an inquiry could inform strategies for fostering greater acceptance and integration of prefabricated construction methods within communities. Lastly, a longitudinal study tracking recent developments and the evolutionary trajectory of prefabricated housing in Libya is imperative. By monitoring changes over time, researchers can identify emerging trends, assess the effectiveness of interventions, and inform future policy decisions in this domain. Moreover, it is essential to compare empirical results with theoretical expectations, noting consistencies and discrepancies. This comparative analysis will provide valuable insights into the practical implications of theoretical

frameworks and help refine future research directions.

In conclusion, this study can foundationally explore the complexities surrounding prefabricated housing adoption in Libya. By shedding light on historical, legislative, and contemporary challenges, we hope to inspire further research that contributes to the sustainable development of the construction industry in the region.

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